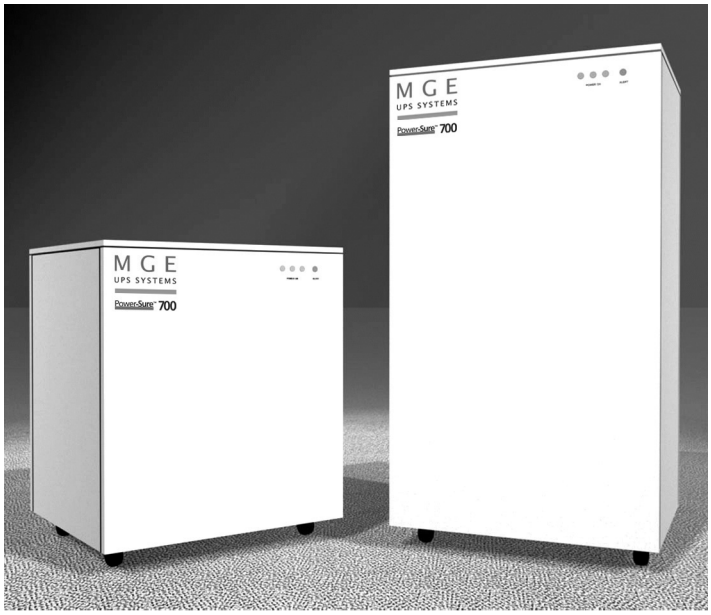
www.mgeups.com



Power-Sure™ 700

Three Phase
Power Conditioners

Installation and User Manual

MGE
UPS SYSTEMS

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS – This manual contains important instructions for Power-Sure™ 700 that must be followed during operation of the equipment.

WARNING **Opening enclosures expose hazardous voltages. Always refer service to qualified personnel only.**

ATTENTION **L'ouverture des cabinets expose des tensions dangereuses. Assurez-vous toujours que le service ne soit fait que par des personnes qualifiees.**

WARNUNG! **Das öffnen der Gehäuse legen gefährliche Spannungen bloss. Service sollte immer nur von qualifizierten Personal durchgeführt werden.**

WARNING **As standards, specifications, and designs are subject to change, please ask for confirmation of the information given in this publication.**

ATTENTION **Comme les normes, spécifications et produits peuvent changer, veuillez demander confirmation des informations contenues dans cette publication.**

WARNUNG! **Normen, Spezifizierungen und Pläne unterliegen Anderungen. Bitte verlangen Sie eine Bestätigung über alle Informationen, die in dieser Ausgabe gemacht wurden.**

NOTE **This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.**

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at user's own expense.

Certification Standards

- ANSI/IEEE C57.12.91 Standards
- IEEE C62.41 cat.A3
- NFPA 70 – National Electrical Code
- FCC rules and regulations of Part 15, Subpart J, Class A
- UL listed under 1012, Power Supplies - General Purpose
- NEMA PE 1 (National Electrical Manufacturers Association)
- NEMA 250 (National Electrical Manufacturers Association)
  – Enclosures for Electrical Equipment (1000 Volts Maximum)
- ISO 9001
- Occupational Safety & Health Administration (OSHA)

WARNING **To reduce the risk of fire or electric shock, install in a temperature and humidity controlled indoor area free of conductive contaminants.**

This equipment is intended only for installations in a RESTRICTED ACCESS LOCATION.

ATTENTION **Pour réduire le riske d'inccendie ou d'électrocution, installer dans une enciente intérieure contrôlée en température et humidité et sans contaminants conducteurs.**

Ce matériel est destiné seulement pour des installations dans un EMPLACEMENT RESTREINT d'cAccès.

WARNUNG! **Um die Gefahr von Feuer und elektrischem Schock zu reduzieren, muss das Gerät in einem temperatur – und feuchtigkeitskontrollierten Raum, frei von leitungsfähigen Verunreinigungen, installiert werden. Dieses Gerät ist nur für die Installation an einem Ort mit eingeschränkter Zugangserlaubnis vorgesehen.**

Diese Ausrüstung ist nur für Anlagen in einem EINGESCHRäNKTEN ZUGRIFF STANDORT bestimmti.

WARNING **HIGH LEAKAGE CURRENT. Earth connection essential before connecting supply.**

ATTENTION **COURANT DE FUITE ELEVE. Raccordement a la terre indispensable avant le raccordement au reseau.**

WARNUNG! **Hoher Ableitstrom Vor Inbetriebnahme Schutzleiterverbindung herstellen.**

How to use this manual and Symbol Usage

This manual is designed for ease of use and easy location of information.

Locate specific topics in the Table of Contents.

Typographical conventions use single quote marks in procedures to denote a prompt for user action:

For example: 1. After the selections are complete, click on the “Save” button.

This manual uses four icon symbols with text to convey important information and tips.

WARNING **indicates information provided to protect the user and service personnel against safety hazards and/or possible equipment damage.**

CAUTION **indicates information provided to protect the user and service personnel against possible equipment damage.**

IMPORTANT **indicates information provided as an operating instruction, or as an operating tip.**

NOTE **indicates information provided as an operating tip or an equipment feature.**

CAUTION: Record All Serial Numbers!

RECORD ALL SERIAL NUMBERS FOR THE POWER-SURE™ 700 AND COMPONENTS. THESE SERIAL NUMBERS WILL BE REQUIRED IF YOUR SYSTEM NEEDS SERVICE. KEEP THIS MANUAL IN A PLACE WHERE YOU CAN REFERENCE THE SERIAL NUMBERS IF SERVICE IS REQUIRED!

POWER-SURE™ 700 SERIAL NUMBER: _____

ADDITIONAL SERIAL NUMBERS:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Power-Sure™ 700

Three Phase
Power Conditioners

Installation and User Manual

Revision History

Power-Sure™ 700 Three Phase Power Conditioners *Installation and User Manual* 86-108814-00			
Revision:	A00	Initial Release	09/2003
	A01	ECN#: 003787	02/2004
	B00	ECN#: 004681	08/2006
	B01	ECN#: 005088	12/2006

For service call
1-800-523-0142

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MGE UPS SYSTEMS

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Introduction

1.0 Scope

This section is a general description of the Power-Sure™ 700 Three Phase Power Conditioners. Includes receiving, location and storage, electrical, mechanical specifications, monitoring, and internal protection for components.

1.1 Reference Manuals

N/A

1.2 Section Descriptions

This manual is divided into three sections:

Section 1: Introduction

This section is a general description of the Power-Sure™ 700 Three Phase Power Conditioners. It includes receiving, location and storage, electrical and mechanical specifications, monitoring and internal protection for components.

Section 2: Installation and Operation

This section describes installation requirements, system dimensions, cable connections, and start-up procedures for the Power-Sure™ 700 Three Phase Power Conditioners.

Section 3: Maintenance

This section contains preventive maintenance for the Power-Sure™ 700, electrical connection troubleshooting, checking power modules (SCR), voltage adjustments, and PCB card troubleshooting to assist the user with communication and configuration connections.

1.3 Receiving and Inspection Notes

Before accepting the shipment from the freight carrier, inspect the exterior surfaces of all shipping containers or packaging used, and the equipment, for damage that may have occurred during transit. If the shipping containers or equipment shows evidence of damage, note the damage on the receiving document (bill of lading) prior to signing for receipt of equipment.

ALL CLAIMS FOR SHIPPING DAMAGE MUST BE FILED DIRECTLY WITH THE CARRIER. Replacements for damaged components should be ordered through MGE UPS SYSTEMS.

Check by thorough inspection if any electrical connections have become loose because of vibration during shipment. Remove top and side panels (Not applicable on 225kVA and larger).

Check the nameplate to be sure that the voltage and frequency match the available power supply. Under no circumstance should the unit be connected to a power source which does not conform to the nameplate rating.

1.3.1 Location and Storage

The unit has been completely inspected and extensively tested under various load conditions prior to shipment. Care to install it at a proper location will assure long trouble free operation. The unit is forced air cooled with the air intake at the bottom, front or sides and exhausts out at the top or rear. Therefore, it should be installed in a clean, dry place with enough clearance to allow a free flow of air.

Allow at least 4 inches of space between the unit and the wall or other equipment for portable units.

Allow enough space for maintenance as indicated on the cabinet outlines. See Section 2.0, Figures 2-1 thru 2-4. If the equipment is to be stored prior to installation, it should be stored in a cool, dry, well-ventilated location that is protected from rain, splashing water, chemical agents, etc. The equipment should be covered with a tarpaulin or plastic wrapper to protect it against dust, dirt, paint, or other foreign materials.

1.4 General Description

The Power-Sure™ 700 is a continuous duty power conditioner designed to supply reliable, clean regulated power to critical loads. An efficient design with state of the art micro-processor controlled solid state devices provide immunity to all line disturbances. The cabinet is a heavy gauge industrial steel throughout. Metal is anti-corrosive phosphate treated prior to paint. Paint is a baked finish.

The basic design consists of a three phase triple shielded isolation transformer with seven separate voltage taps per phase. Output regulation is achieved by monitoring the input and automatically switching taps anytime the input line sags or surges. The use of a triple shielded isolation transformer provides superior common mode and transverse mode noise attenuation. Automatic switching occurs during current zero allowing noise free switches for both leading and lagging power factor loads that are connected to the Power-Sure™ 700.

The Power-Sure™ 700 Power Conditioner is operated by simply turning on the main AC input circuit breaker. As an option, units may have a bypass switch. This is a no load switch and MUST only be operated when the unit is OFF. The bypass switch should be in the “NORMAL” position unless a problem occurs with the system. If a problem occurs, turn OFF the main AC circuit breaker and turn the bypass switch to the “BYPASS” position. Re-energize the system by turning on the AC circuit breaker and contact the Customer Care Center for repairs.

Any ‘ALERT” condition requires the main AC input breaker to be turned off in order to reset the “ALERT” light.

1.4.1 Electrical and Performance Specifications

***Output**	Maintained to within ± 3% of nominal.
***Input**	+10% to -20% of the nominal rated input.
***Frequency**	60 Hertz ± 3 Hertz.
Efficiency	95% Minimum.
Line Regulation	Output is ± 3% of nominal for input variations of +10% to -20% of nominal.
Load Regulation	Output maintained within 3% from no load to full load.
Response Time	1/2 Cycle.
Correction Time	Output will correct in one step to within ±3% of nominal in 1.5 cycles or less.
Harmonic Distortion	Adds less than 1.0% THD.
Transverse-Mode Noise Attenuation	3 dB down at 1000 Hertz, 40 dB decade to below 50 dB with resistive load.
Common-Mode Noise Attenuation	120 dB or greater.
Audible Noise	45 dB to 55 dB, depending on kVA rating.
Turn On Characteristics	When energized voltage overshoot will be less than 5% of nominal for 1 cycle or less.
Overload Rating	1000% for 1 cycle and 200% for 10 seconds.
Ambient Rating	-10 to +40 degrees Celsius.

*Optional extended input regulation range provided on some units. If provided, reference description next to the units specification tag. 50 Hz models available.

Listed to UL1012, Standard for “power units other than Class 2”.

1.4.2 Main Transformer Specification

Windings	All copper.
Magnetics	Grain orientated, M6 grade, stress relieved transformer steel is utilized for minimum losses and maximum efficiency.
Insulation	Class (N) 200 all sizes.
Shielding	Multiple triple copper shield to minimize interwinding capacitance, transient, and noise coupling between primary and secondary windings.
Cooling	Convection, operating temp is 130 degrees Celsius maximum rise above ambient.
Isolation	Output is fully isolated from input.

1.4.3 Input Breaker

Main input molded case circuit breaker, rated at 125% of full load input current.

1.5 Monitoring the Power-Sure™ 700

Monitoring of the Power-Sure™ 700 is simple, clean, and effective. Three green light indicators are utilized to display “POWER ON” (output line to neutral for each phase) and one red light indicator to display “ALERT”. The “POWER ON” display is connected directly to the output that indicates the Power-Sure™ 700 is operating properly with just a quick glance. The “ALERT” display represents an overtemp problem or output voltage loss (optional) when illuminated, and will shut down the output, but cooling fans remain on. Overtemp thermal sensors are strategically located at critical points on the regulator assemblies and transformer. The main AC input circuit breaker must be turned off in order to reset the “ALERT” light.

1.6 Protection for the Power-Sure™ 700

Protection is accomplished very effectively to minimize failures and the cost of repairs by the four major methods listed below:

1. The input is protected with a integrally mounted AC circuit breaker for abnormal current overloads and provides a convenient means of disconnecting utility power.

   As an option, the input breaker may be equipped with a shunt trip device that is interfaced with a REMOTE EMERGENCY POWER OFF PUSH BUTTON. By pressing this button, the input breaker will trip and disable the Power-Sure™ 700 completely. The input breaker must be physically reset before unit will turn on again.

2. The electronic regulating devices are protected with fast acting semi-conductor fuses. These fuses are designed to clear before damage occurs to the more expensive SCR regulating devices. The main transformer is protected by fuse links connecting the SCR regulators together, and are designed to clear in the event that two or more SCRs should fail. This will prevent a transformer tap short and the possibility of transformer failure.

3. When provided with the optional Under/Over Voltage Shutdown Card (UOV2020), the output of the Power-Sure™ 700 is constantly monitored for extreme over and under voltage conditions. This card monitors each output phase and will electronically disable the Power-Sure™ 700 when any phase exceeds +10% or -10% of nominal output voltage.

4. Overtemp sensing devices are mounted at critical points on the SCR regulating assembly and the main transformer. When an overtemp condition exists the “ALERT” light will illuminate and hold until the overtemp is corrected. There are no automatic shutoff circuits for the “ALERT” condition. The main AC input breaker must be turned off in order to reset the “ALERT” light.

Installation and Operation

2.0 Scope

This section describes installation requirements, system dimensions, cable connections, and start-up procedures for the Power-Sure™ 700 Three Phase Power Conditioners.

WARNING: **HIGH VOLTAGE, ONLY QUALIFIED ELECTRICIANS SHOULD INSTALL OR PERFORM MAINTENANCE.**

2.1 Installation Notes

- The Power-Sure™ 700 requires ventilation. Reference Section 1.3.1 for cabinet placement for each model.
- After installation is complete, verify the output voltage is within its rated specifications.
- Provide overcurrent protection per article NFPA 70 latest revision article 450-3(b).
- Optional output cables must be specified in lengths of 10 feet, cables may have receptacles on the terminating end.
- For installation of conduit, reference NEC Article 348 and 350 and any applicable local electrical codes.

Refer to the following installation diagrams for electrical hookup.

2.2 MGE UPS Systems Power-Sure™ 700

An efficient installation depends on careful planning and site preparation. Installation of the equipment must be handled by skilled technicians and electricians familiar with the special requirements of high-voltage electrical equipment. The installation must comply with the requirements of the National Electrical Code (ANSI/NFPA 70, latest issue) and local codes as applicable, and safety standard, UL1012 listed; UL1449 compliant; meets FCC Cat. A.

We strongly recommend contacting MGE for system start-up. Do not allow unqualified personnel to handle, install, or operate the Power-Sure™ 700.

A good way to insure that the Power-Sure™ 700 is sized properly is to use the following guide lines:

- List each piece of equipment, include Model, Voltage, Current and kVA.
- Calculate kVA of load plus a safety margin.
- When this is not possible, gather the data by reading the specification plate of the equipment you plan on backing up.
- One method is to ask the vendor of the computer equipment to supply you with the information you need.
- Be sure to verify the input supply voltage and the output requirements of the Power-Sure™ 700.

2.3 Power-Sure™ 700 Installation Drawings and Cabinet Dimensions

When sizing the Power-Sure™ 700, be sure to take into consideration all loads and circuits the Power-Sure™ 700 is to supply.

Figure 2-1: Power-Sure™ 700 — 10-15kVA Mechanical Cabinet Measurements.

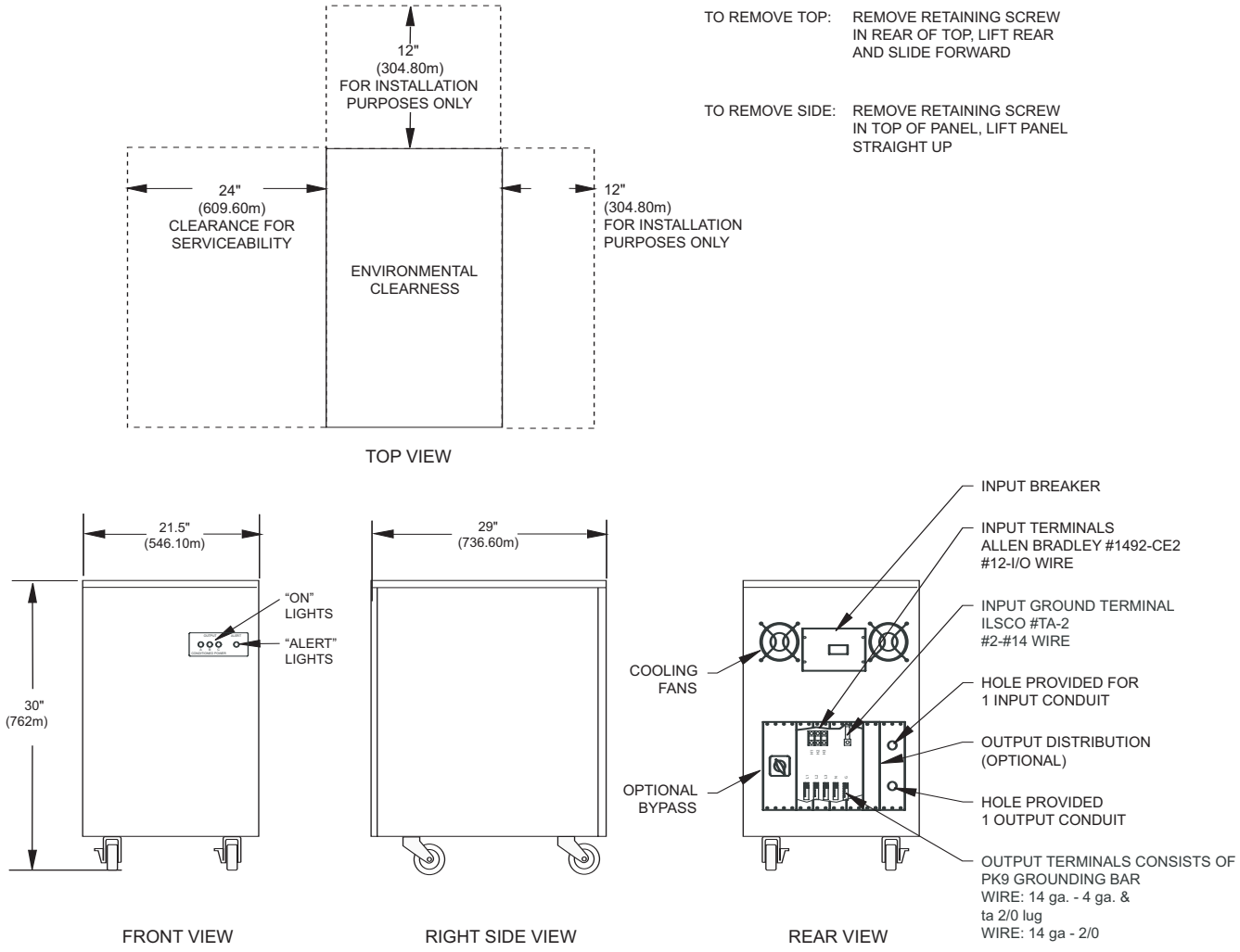

TO REMOVE TOP: REMOVE RETAINING SCREW IN REAR OF TOP, LIFT REAR AND SLIDE FORWARD
TO REMOVE SIDE: REMOVE RETAINING SCREW IN TOP OF PANEL, LIFT PANEL STRAIGHT UP
12" (304.80m) FOR INSTALLATION PURPOSES ONLY
24" (609.60m) CLEARANCE FOR SERVICEABILITY
ENVIRONMENTAL CLEARNESS
12" (304.80m) FOR INSTALLATION PURPOSES ONLY
TOP VIEW
21.5" (546.10m)
30" (762m)
"ON" LIGHTS
"ALERT" LIGHTS
FRONT VIEW
29" (736.60m)
RIGHT SIDE VIEW
INPUT BREAKER
INPUT TERMINALS ALLEN BRADLEY #1492-CE2 #12-I/O WIRE
INPUT GROUND TERMINAL ILSCO #TA-2 #2-#14 WIRE
COOLING FANS
HOLE PROVIDED FOR 1 INPUT CONDUIT
OUTPUT DISTRIBUTION (OPTIONAL)
OPTIONAL BYPASS
HOLE PROVIDED 1 OUTPUT CONDUIT
OUTPUT TERMINALS CONSISTS OF PK9 GROUNDING BAR WIRE: 14 ga. - 4 ga. & ta 2/0 lug WIRE: 14 ga - 2/0
REAR VIEW

Figure 2-2: Power-Sure™ 700 — 25-30kVA Mechanical Cabinet Measurements.

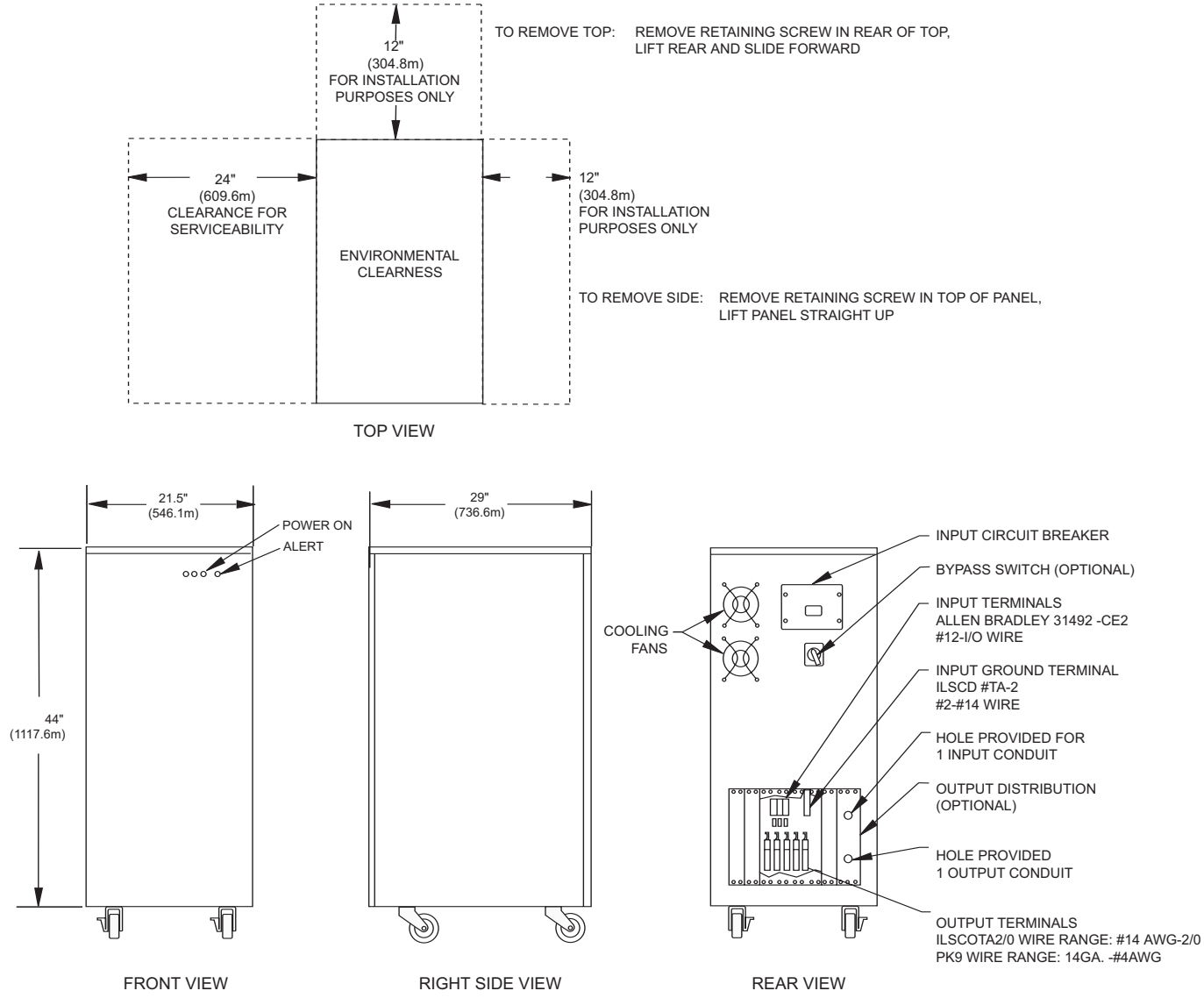
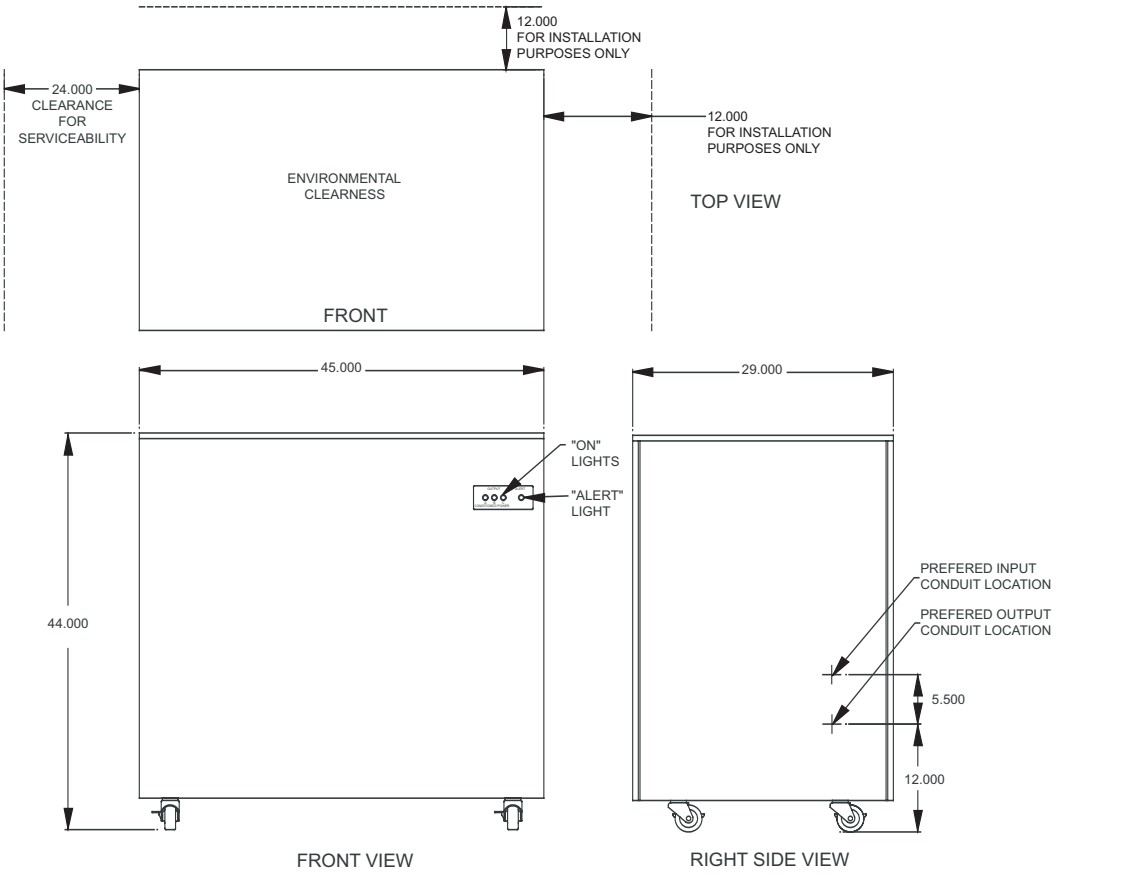


Figure 2-3: Power-Sure™ 700 — 45-150kVA Mechanical Cabinet Measurements.



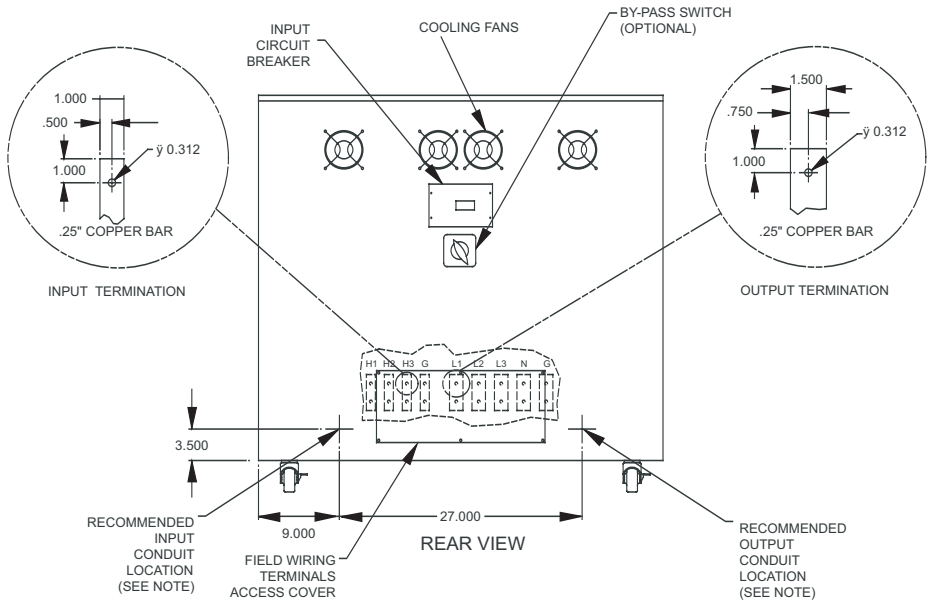
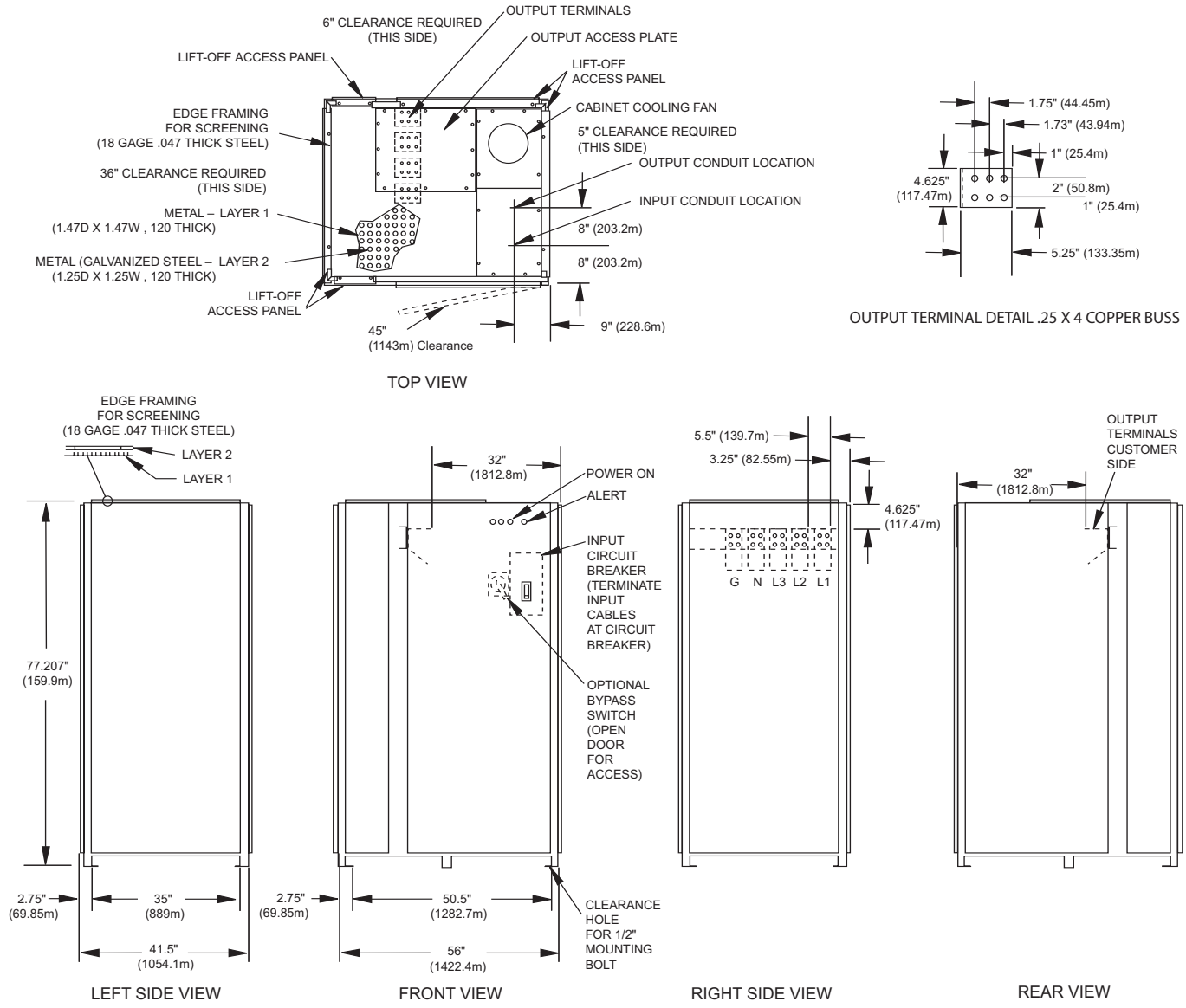


Figure 2-4: Power-Sure™ 700 — 225-300kVA Mechanical Cabinet Measurements.



2.4 General Operation Notes

The Power-Sure™ 700 Power Conditioners provides the triple function of isolation, noise attenuation and voltage regulation. The first two functions are provided by the power transformer, where as the third function of voltage regulation is achieved through solid state thyristors (SCRs) connected to taps on the power transformer. A micro-processor monitors and controls the overall function of regulating the system.

The power transformer is manufactured with a unique method of shielding which produces very low capacitive coupling between the primary and secondary. This low coupling provides excellent attenuation of the common-mode noise. In addition, special care is taken in the design of the transformer to attenuate transverse-mode noise above 1000 Hz. The power transformer has taps to which solid state switches (SCRs) are connected.

The voltage regulator incorporated in the Power-Sure™ 700 Power Conditioners is microprocessor controlled to achieve optimum correction time of input voltage sags and surges. The response time is typically one (1/2) cycle for 100% correction, therefore, a very smooth switch takes place undetected by computer equipment.

As the input voltage (building power) varies, the voltage available at each tap of the transformer will also change. The amount of variation is dependent upon the input sag or surge, turns ratio and transformer losses.

By selecting a particular tap voltage, the output can be kept within a tight range. The way in which this is accomplished is that an electronic control card using a micro-processor continually monitors the input voltage. When a voltage fluctuation occurs, which exceeds the limit of rated regulation (typically ± 3%), the output is switched to another tap, that is within the required range. This switch will be made at the next current zero crossing to allow for both leading and lagging power loads to be connected to the conditioner.

2.5 Power-Sure™ 700 Cable Connections

2.5.1 Input Wire Size, Grounding, and Output Wiring

- Conduit should be used for both input and output wiring.
- Minimum ground wire size is based on 1990 Nation Electric Code Table 250-95.
- Input wire size is based on 1990 NEC Table 310-16 specifying not more than 3 conductors in a raceway based on ambient of 30 degrees Celsius, and wire rated at 75 degrees Celsius.
- Output neutral to ground is already bonded during manufacturing of Power Conditioner.
- Output requires 4 (5 including ground wire) conductors in a raceway assuming neutral as a current carrying conductor. This requires conductors to be derated by using a multiplier of .8, reference 1990 NEC Article 310 Section 8A.

Example:

1. Assume #10 wire max current = 25 Amps.
2. Multiply 25 x .8 = 20.
3. 20 Amps is max current for #10 wire in a raceway with 4 conductors.

NOTE: **Installation is subject to local codes – verify with a local electrical inspector.**

Table 2-1: 480 VAC Input and 208 VAC Output Wire Size Chart.

Unit Size in kVA	Input Breaker Size	Input Wire Size	Minimum Ground Wire Size	Maximum Output Current
10	15 Amp	#10	#10	28
15	25 Amp	#10	#8	42
25	50 Amp	#8	#4	70
30	50 Amp	#8	#4	83
45	80 Amp	#6	#2	125
50	80 Amp	#6	#2	139
75	125 Amp	#1	#6	208
100	150 Amp	1/0	4/0	278
125	200 Amp	1/0	2 pcs 1/0	347
150	225 Amp	1/0	2 pcs 2/0	417
225	350 Amp	4/0	2 pcs 250	625
300	500 Amp	2 pcs 2/0	3 pcs 250	833

Table based on 480 VAC input and 208 VAC output.

Table 2-2: 208 VAC Input and 208 VAC Output Wire Size Chart.

Unit Size in kVA	Input Breaker Size	Input Wire Size	Minimum Ground Wire Size	Maximum Output Current
10	40 Amp	#8	#10	28
15	60 Amp	#8	#8	42
25	110 Amp	#4	#4	70
30	110 Amp	#4	#4	83
45	175 Amp	#1	#2	125
50	175 Amp	#1	#2	139
75	300 Amp	2/0	2/0	208
100	350 Amp	4/0	4/0	278
125	450 Amp	2 pcs 1/0	2 pcs 1/0	347
150	600 Amp	2 pcs 3/0	2 pcs 3/0	417
225	800 Amp	2 pcs 250	2 pcs 250	625
300	1200 Amp	3 pcs 250	3 pcs 250	833

Table based on 208 VAC input and 208 VAC output.

NOTE: **Refer to NEC for output wire size based on output breaker size and Article 310 Section 8A.**

2.6 Start-Up Sequence

WARNING: **THERE ARE DANGEROUSLY HIGH VOLTAGES PRESENT WITHIN THE ENCLOSURE OF THE POWER SUPPLY SYSTEM. CAUTION MUST BE TAKEN WHEN WORKING WITH THE ENCLOSURE. IT IS RECOMMENDED THAT ALL WORK BE PERFORMED BY QUALIFIED ELECTRICAL PERSONNEL ONLY.**

NOTE: INITIAL START-UP SHOULD BE PERFORMED WITH NO-LOAD ON THE SYSTEM.

1. Re-install all panels that may have been removed during installation.
2. Make sure the input circuit breaker is in the off position.
3. Energize the primary building power.
4. Turn on the main AC input breaker.
5. Verify that the output voltage is within the specified range.
6. Verify output phase rotation is correct.
7. Turn the system off.
8. Connect the loads one at a time and repeat Step 5.

Maintenance

3.0 Scope

This section contains preventive maintenance for the Power-Sure™ 700, electrical connection troubleshooting, checking power modules (SCR), voltage adjustments, and PCB card troubleshooting to assist the user with communication and configuration connections.

WARNING: **HIGH VOLTAGE DANGER OF ELECTRICAL SHOCK, TURN OFF ALL POWER SUPPLING THIS EQUIPMENT PRIOR TO MAINTENANCE. ONLY QUALIFIED ELECTRICIANS SHOULD PERFORM MAINTENANCE OR TROUBLE SHOOTING.**

3.1 Preventive Maintenance

To ensure longer component life and trouble free operation, minor preventive maintenance procedures should be performed at regular intervals, recommended once every year. More frequent inspection intervals would be needed for more severe operation conditions and and larger number of hours of continuous operation.

At each service inspection, remove any dust, dirt or foreign particles. Thoroughly inspect and tighten any loose electrical connections. A slight tug should be used to test if there are any loose electrical connections. Make sure all cooling fans are running.

A. At each service inspection, remove top and side panels and carefully remove any accumulated dust, dirt, or foreign particles. Special care should be exercised in cleaning the thyristors, heat sinks, and the control assembly.

B. Inverse Parallel Silicon Rectifiers (SCRs) or Thyristors.

   The silicon controlled rectifiers (SCRs) usually fail in the shorted mode. When this happens, normally the fusible link within the SCR will be blown open to clear the short and prevent damage to the transformers. The individual SCR can be checked with an ohmmeter. Refer to Section 3.4 for resistance checking procedures.

C. A simple performance checklist has been developed for use in maintenance, on pages 3-2 and 3-3. Check off items 1-8.

D. After items 1-8 have been checked on the performance checklist, the next step is to check the operation of the system.

E. Replace top and side panels. Turn unit on with no load. Check item 9 on the performance checklist.

F. Turn on loads and check items 10-13 of the performance checklist.

NOTE: **Preventive Maintenance plans are available. Please contact the Customer Care Center for information.**

Power-Sure™ 700 Performance Checklist

Company: _____

Model #:_____**Serial #**: _____

1. **Customer Comments or Problems:**

_____

2. **Power Conditioner Environment** (clean and dust free): Yes_____ No_____

3. **Phase Rotation Correct** (ABC): Yes_____ No_____

4. **Electrically wired properly** (ie., conductor sizing, breakers, grounding): _____

5. **Verify Input Voltage** (see spec. tag):

_____

6. **Check Tightness of Electrical Connections**:

   Input Connections_____ Output Connections_____ Heatsink Connections (SCRs) _____

   Circuit Board Connections_____ By-Pass Switch_____ Fuse Connections_____

   Fan Connections_____ Transformer Connections_____

7. **Exercise all Circuit Breakers**:

   Input Breaker_____ Output Breakers _____

8. **Resistance Check of all Semiconductors Power Modules** (SCRs):

Phase A	Phase B	Phase C
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

NOTE: **Must remove Semiconductor Fuses from circuit prior to resistance checking SCRs.**

Power-Sure™ 700 Performance Checklist *(Continued)*

9. **Input/Output Voltage Checks** (Adjust as needed):

No Load Input	No Load Output	
A-B_____VAC	AN_____VAC	A-B_____VAC
B-C_____VAC	BN_____VAC	B-C_____VAC
A-C_____VAC	CN_____VAC	A-C_____VAC

10.

Available Load Input	Available Load Output	
A-B_____VAC	AN_____VAC	A-B_____VAC
B-C_____VAC	BN_____VAC	B-C_____VAC
A-C_____VAC	CN_____VAC	A-C_____VAC

11. **Input/Output Current Checks** (Balance as needed):

Input	Output
A_____Amps	A_____Amps
B_____Amps	B_____Amps
C_____Amps	C_____Amps
	N_____Amps
	G_____Amps

12. **Fans Operational:**

_____

13. **Testing Shutdown Circuitry ie...REPO, Over/Under Voltage:**

_____

14. **Comments**:

_____

_____

_____

_____

3.2 Troubleshooting Guide

SYMPTOM	PROBABLE CAUSES
1. No Output on One or More Phases.	A. Blown Fuse. B. Defective SCR or Power Module C. Defective Control Card. D. Defective Sense Card. E. No Input.
2. Output is to High or to Low.	A. Control Card Adjustment. B. Defective Control Card. C. Defective Sense Card. D. Defective SCR or Power Module E. Input Out of Range.
3. Input Breaker Tripping Off.	A. Defective Breaker. B. System Overloaded. C. Over/Under Voltage Detection is Shutting Down System (See Symptom #2). D. Defective Over/Under Detection Card. E. Shorted Taps.
4. Blowing Semi-Conductor Fuses.	A. Shorted SCRs or Power Modules B. Output Loads Shorted.
5. No Output Voltage.	A. Defective Over/Under Output Detection PCB.

WARNING: **THERE ARE DANGEROUSLY HIGH VOLTAGES PRESENT WITHIN THE ENCLOSURE OF THE POWER SUPPLY SYSTEM. UNDER NO CIRCUMSTANCES SHOULD ANY PERSON REACH WITHIN THE ENCLOSURE OF THIS EQUIPMENT. ALL SERVICE TO THIS PIECE OF EQUIPMENT SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.**

3.3 Troubleshooting Power Line and Electrical Connections

NOTE: **Circuit diagrams in this manual are for reference only. Always refer to the actual circuit diagrams received with the system.**

This procedure is written in a specific order and must be used from start to finish when troubleshooting. Any steps skipped over may cause serious damage to the system.

Required equipment for troubleshooting the Power-Sure™ 700 is a True RMS Digital multimeter, SCR tester, common hand tools, and a spare parts kit.

3.3.1 Step 1. Disassembling the Power Conditioners

1. Turn off the power to the conditioner at its source.
2. Turn off the input circuit breaker on the unit and the output circuit breakers to all loads. (Remove all loads from unit).
3. Remove the top and side covers to the conditioner.

3.3.2 Step 2. Electrical Connections, Fuses

Refer to Sections 3.7 and 3.8 for component locations.

1. Inspect the unit for proper tightness of all electrical connections, burnt, frayed, broken or loose connections, and components in these areas.
2. Input and output connections, SCR assembly, SCR snubber, output filter assembly, MOVs (metal oxide varistors), circuit boards, bypass switch, and transformer connections need to be checked.
3. Correct and tighten any loose connections. Replace any physically burned or broken components.
4. Check all fuses in system (see NOTE). Also check time delay fuses, semi-conductor fuses, fan fuses, circuit board fuses, and SCR fusible link wire.

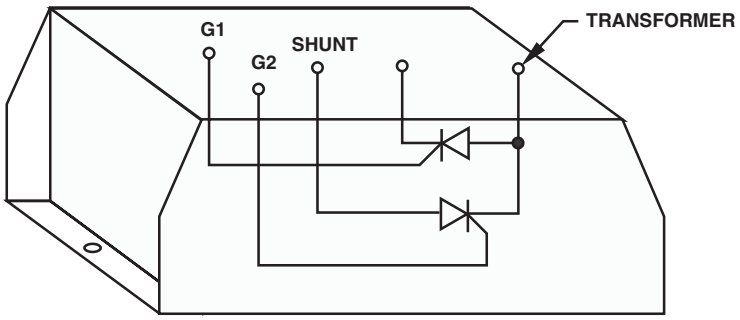
NOTE: **Remove fuses from circuit when checking to avoid false readings.**

3.4 Checking the Power Modules (SCR)

Refer to Section 3.8 Figures for specific 10-30kVA SCR, 45-50kVA SCR, 75-150kVA SCR, and 225-300kVA for SCR assemblies.

1. Unplug the connections to the control cards Part #49120/407415 labeled TB1, TB2, and TB3.
2. Disconnect any cooling fans in the unit so your SCR resistance checks are not interfered with by fan motor coils. Also remove main semi-conductor fuse located on all 3 SCR assemblies and any wires attached to the fuse. Each power module contains 2 inverse parallel SCRs.

Figure 3-1: Power Module.



POWER MODULE

3. Measure the following resistance on each power module. There are 7 per phase or 21 for all three phases. Refer to the circuit diagrams received with your unit.

NOTE: **When checking the power module assembly, if more than one defective power module is present it will appear as if all the power modules are defective.**

The individual power module must be isolated from the power transformer:

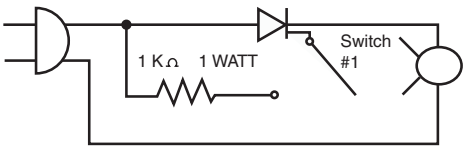
- K1-1 to K2-1 thru K1-7 to K2-7 = High resistance, 1 Meg Ohm.
- K1-1 to G1-1 thru K1-7 to G1-7 = 10 to 90 Ohms.
- K1-1 to G2-1 thru K1-7 to G2-7 = 1 Meg Ohm.
- K2-1 to G2-2 thru K2-7 to G2-7 = 10 to 90 Ohms.
- K2-1 to G1-1 thru K2-7 to G1-7 = 1 Meg Ohm.
- G1-1 to G2-1 thru G1-7 to G2-7 = 1 Meg Ohm.

4. Replace any defective power modules. This may require removing the shunt and loosening the K1 bus from all the power modules to get the defective power module out. Use only equivalent hardware and heat sink grease when replacing power modules.
5. If a resistance measure is questionable, a more thorough test will assure an SCR is good or bad.

Test procedure:

- Completely isolate SCR under test by removing all connections to the device.
- Hook up the following test circuit to each individual SCR.
- Plug in SCR tester. With Switch #1, open light bulb should be off. If not, replace SCR.
- Close Switch #1. Light bulb should illuminate to about 3/4 brilliance. If not, replace SCR.

Figure 3-2: Test Wire Diagram.



6. Reassemble the power module assembly, making sure all connections are tight.

DO NOT CONNECT THE SEMI-CONDUCTOR FUSE, WIRES OR FAN WIRES AT THIS POINT.

3.5 Check SCR Snubber Card

Three components make up the SCR snubber: Resistors, MOVs and Capacitors.

- Check for open resistors.
- Check MOVs for shorts, they should read high resistance when ohm meter is placed across them.
- Resistance check each capacitor. The DC resistance across the snubber capacitor should look capacitive, that is high resistance after the meter charges the capacitor.
- If it measures open or shorted, replace the snubber card.

RE-CONNECT SEMI-CONDUCTOR FUSE, AND ALL WIRES AND FANS. DOUBLE CHECK THAT ALL CONNECTIONS ARE SECURE.

NOTE: **Control board #49120 is for 10kVA to 50kVA units. Control board #407415 is for 75kVA and larger.**

DO NOT CONNECT TB1, TB2, and TB3 CONNECTORS FROM THE CONTROL CARDS #49120/407415 YET!

3.5.1 Check Control Card and Filter Card

1. Verify input to the conditioner matches the units specification. Also verify correct control board #49120 / 407415 jumper setup. See Figure 3-11, Page 3-16.
2. Disable the over/under voltage shutdown card #35867 (optional card) by removing connectors K1 and K2 on the card.
3. Turn on AC input breaker to unit.

IMPORTANT: **Extreme caution must be taken when measuring voltages on Molex connectors. Do not press meter leads into connectors or bend connectors back.**

4. Measure the following voltages on wires feeding the TB1 Molex connector to the control card on all 3 phases.

   Pins 1 & 3 = 4-6 VAC.

   Pins 7 & 8 = 120 VAC

NOTE: **When the connector is plugged in, this voltage is around 3 VAC.**

If this voltage is incorrect or not present, then check the fuses associated with the filter card or replace filter card and re-check voltages.

5. Turn main AC circuit breaker off. Plug in connectors TB1 and TB3 ONLY on the control card #49120/407415 on all 3 phases.
6. Turn main AC on. With DC voltmeter on the millivolt scale check between TP1 and TP GND of the control card and adjust pot P2 so meter reads “0” millivolts or close as possible.

NOTE: This step does not apply to Control Board #407415.

7. Use the following formula to calculate the next adjustments. You must calculate each input phase for each control card or a total of 3 calculations.
   - For phase 1, control card measures AC input at Line 1 to Line 2.
   - For phase 2, control card measures AC input at Line 2 to Line 3.
   - For phase 3, control card measures AC input at Line 1 to Line 3.

FORMULA

AC Input x 2.47 = Volts DC at TP2
480 (Nominal)

Example: 475 Volts AC Input x 2.47 = 2.44 Volts DC at TP2
480 (Nominal)

8. After calculations are complete, place DC voltmeter on the 20 volt scale and check between TP2 and TP GND on control card. Adjust pot P1 so meter reads DC level calculated in Step 7 of Section 3.5.1 for all three phases.

NOTE: **If adjustments in Steps 6 and 7 are not possible, replace control card #49120/407415 and repeat Steps 6 and 8.**

Be sure to turn power off when replacing circuit boards.

Be sure AC input is stable when making this adjustment. If the input changes, you must re-calculate.

Output voltage correction is a "stepped correction". Adjusting P1 will not cause a smooth change in output voltage as it is adjusted.

9. Turn the unit off. Plug in TB2 Molex connectors to all the control cards #49120/407415.
10. Replace connectors K1 and K2 on over/under detect #35867.

NOTE: **P1 pot turned clockwise = decrease in output voltage and counter-clockwise = increase in output voltage. By changing this adjustment on phase1 you may see the output voltage change from line to neutral on two phases. It is best to use procedures in Steps 1 – 9 of Section 3.6.**

3.6 Final Testing and Adjustments

1. Connect AC voltmeter to output of system with proper meter scale selected.

NOTE: **On 3 phase systems, connect your AC voltmeter across the output phase to neutral.**

2. Disconnect customers loads.
3. Energize system.
4. Verify the output is within specifications. If not, adjust P1 on control board, for the appropriate phase. See Section 3.9.2, Control Card Adjustment Procedure, page 3-16.

NOTE: **On 3 phase systems, be sure and check all 3 phases.**
If the main AC breaker trips or there is no output voltage, disable the over/under detect circuit #35867 by disconnecting K1 and K2 connectors and then calibrate the control boards if the output voltage is out of spec.

5. Turn the input circuit breaker off.
6. Connect customers equipment.
7. Energize system.
8. Repeat Step #4 and adjust as needed.
9. Be sure over/under detect is connected and if input breaker trips or there is no output voltage, re-calibrate the detect board or replace board if defective.

3.7 Unit Component Location Diagrams

Figure 3-3: Power-Sure™ 700 — 10-15kVA Major Components.

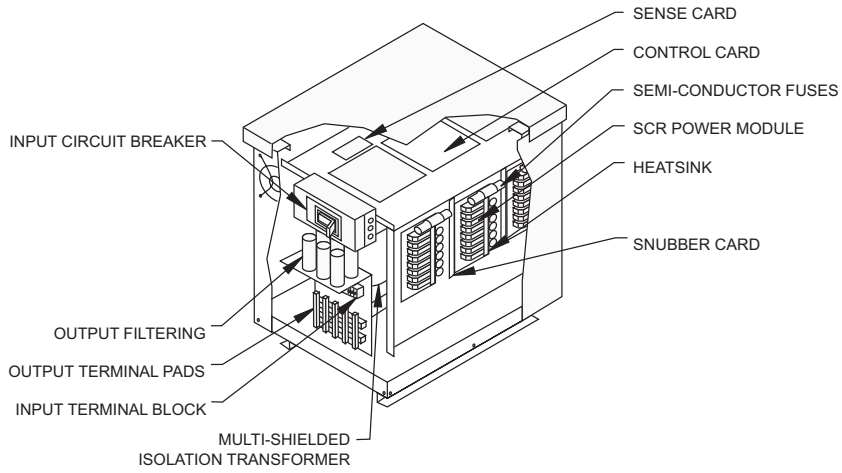


Figure 3-4: Power-Sure™ 700 — 25-30kVA Major Components (Rear View).

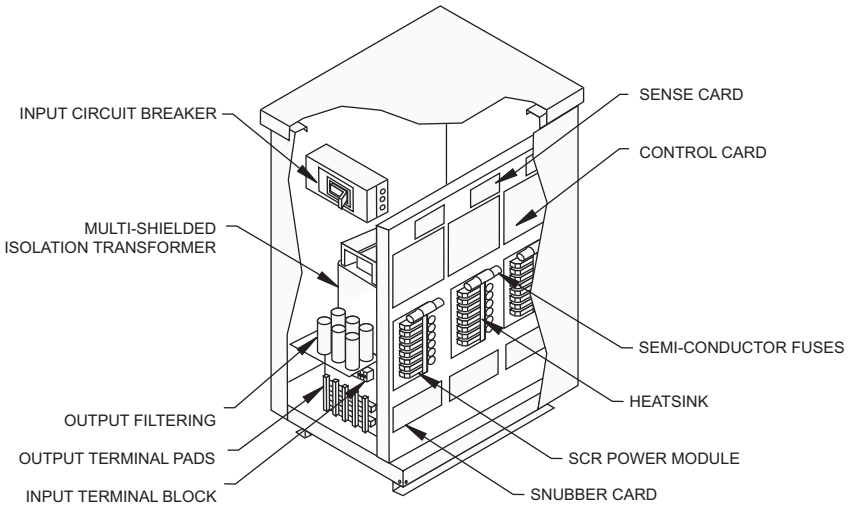


Figure 3-5: Power-Sure™ 700 — 45-150kVA Major Components (Rear View).

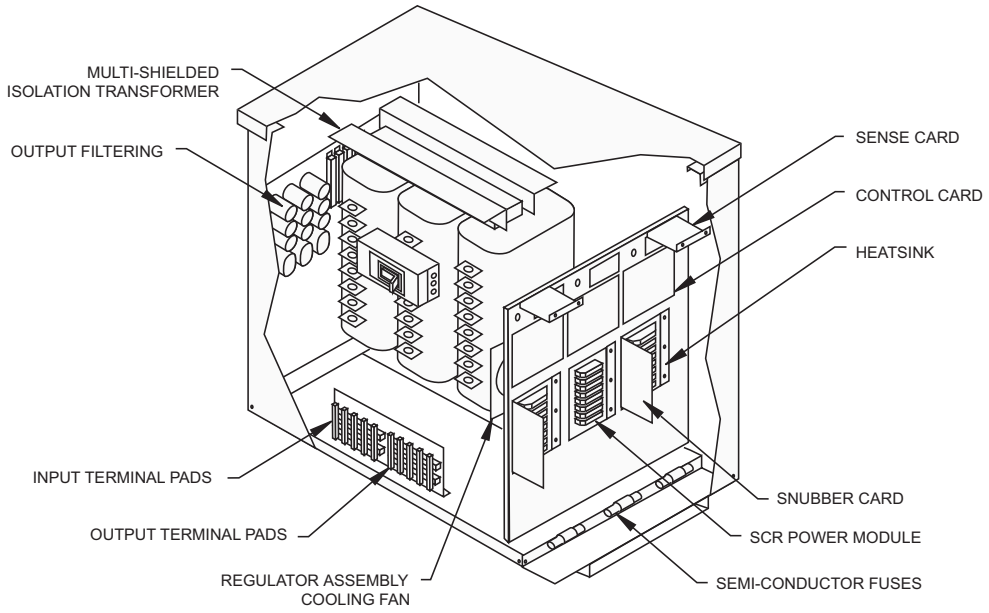
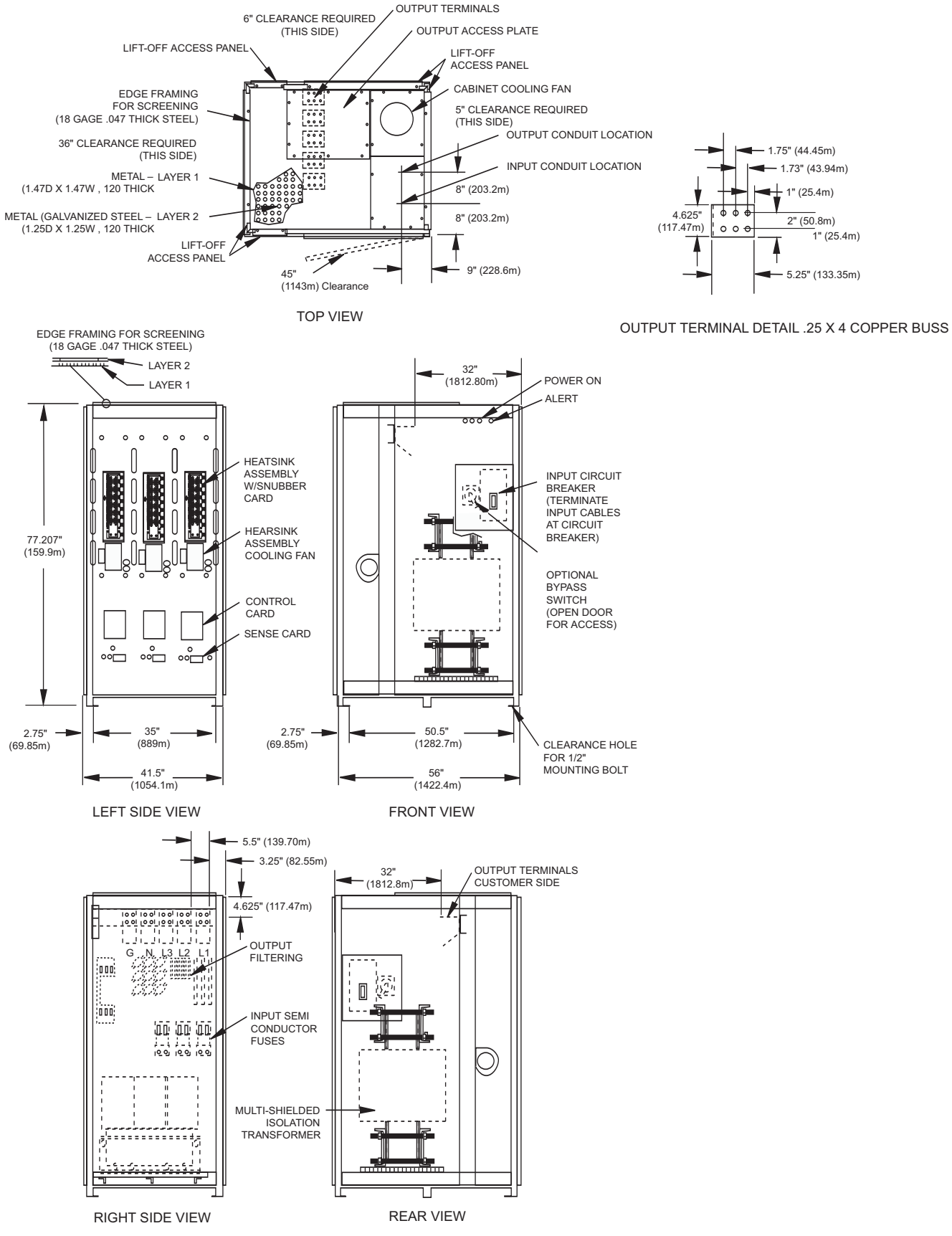


Figure 3-6: Power-Sure™ 700 — 225-300kVA Cable Connections, Input Output Locations.



3.8 SCR Heat Sink Assemblies

Figure 3-7: Power-Sure™ 700 — 10-30kVA SCR Heatsink Assembly.

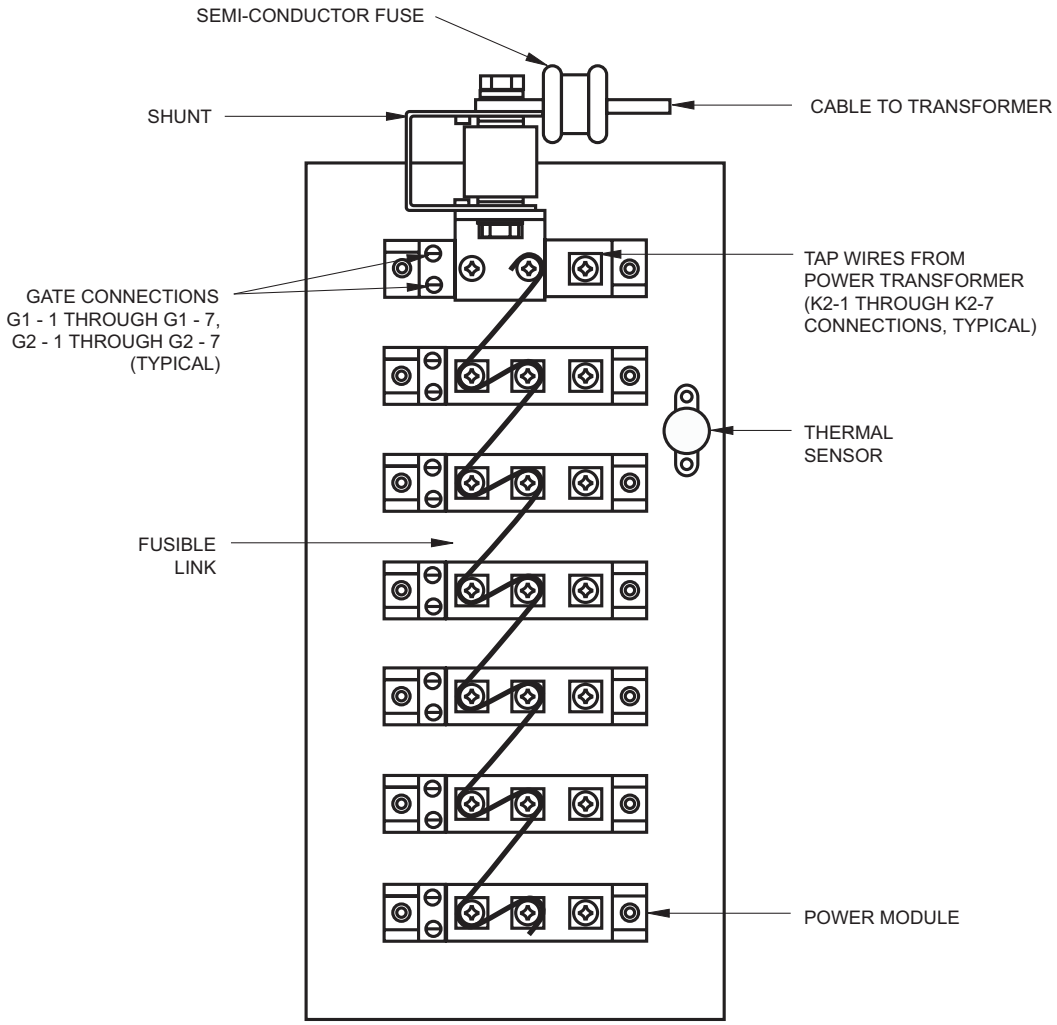

SEMI-CONDUCTOR FUSE
SHUNT
CABLE TO TRANSFORMER
TAP WIRES FROM POWER TRANSFORMER (K2-1 THROUGH K2-7 CONNECTIONS, TYPICAL)
GATE CONNECTIONS G1 - 1 THROUGH G1 - 7, G2 - 1 THROUGH G2 - 7 (TYPICAL)
THERMAL SENSOR
FUSIBLE LINK
POWER MODULE

Figure 3-8: Power-Sure™ 700 — 45-50kVA SCR Heatsink Assembly.

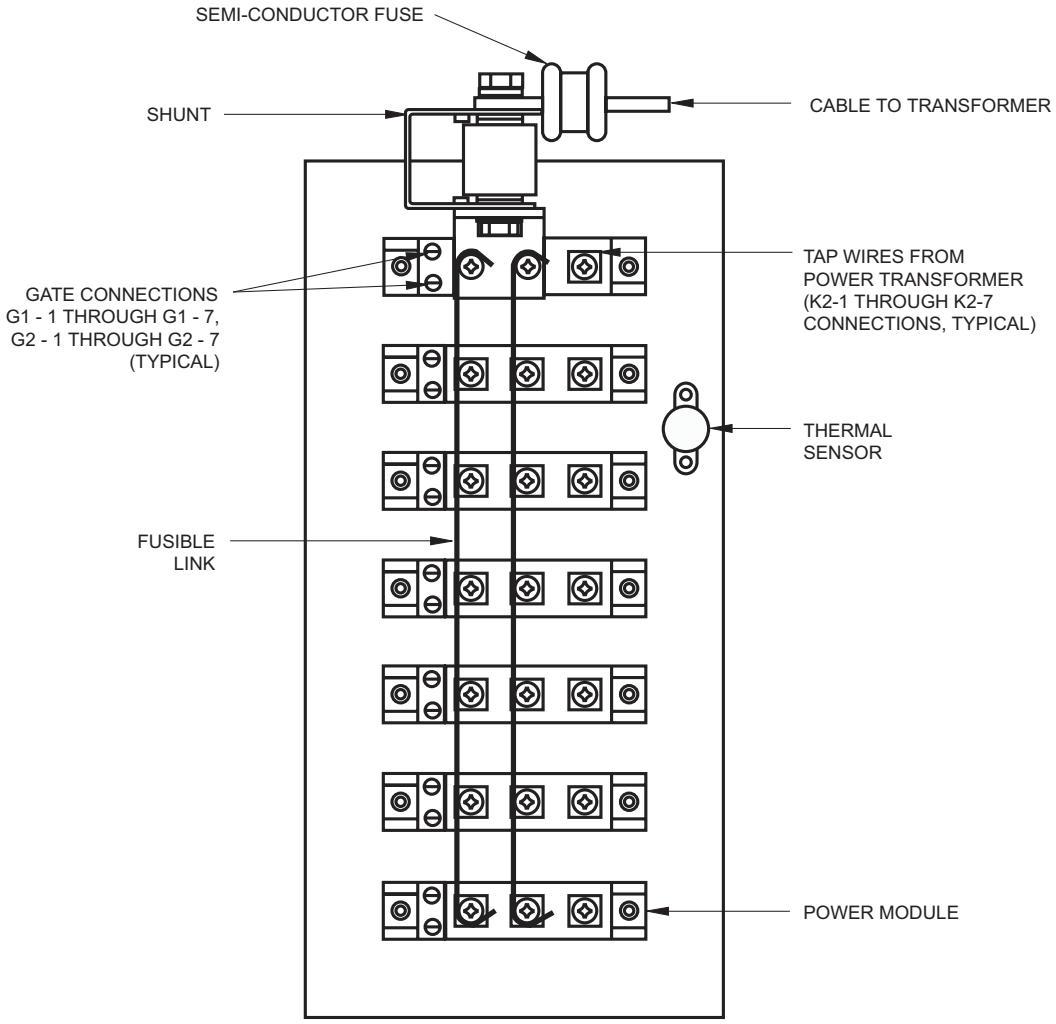


Figure 3-9: Power-Sure™ 700 — 75-150kVA SCR Heatsink Assembly.

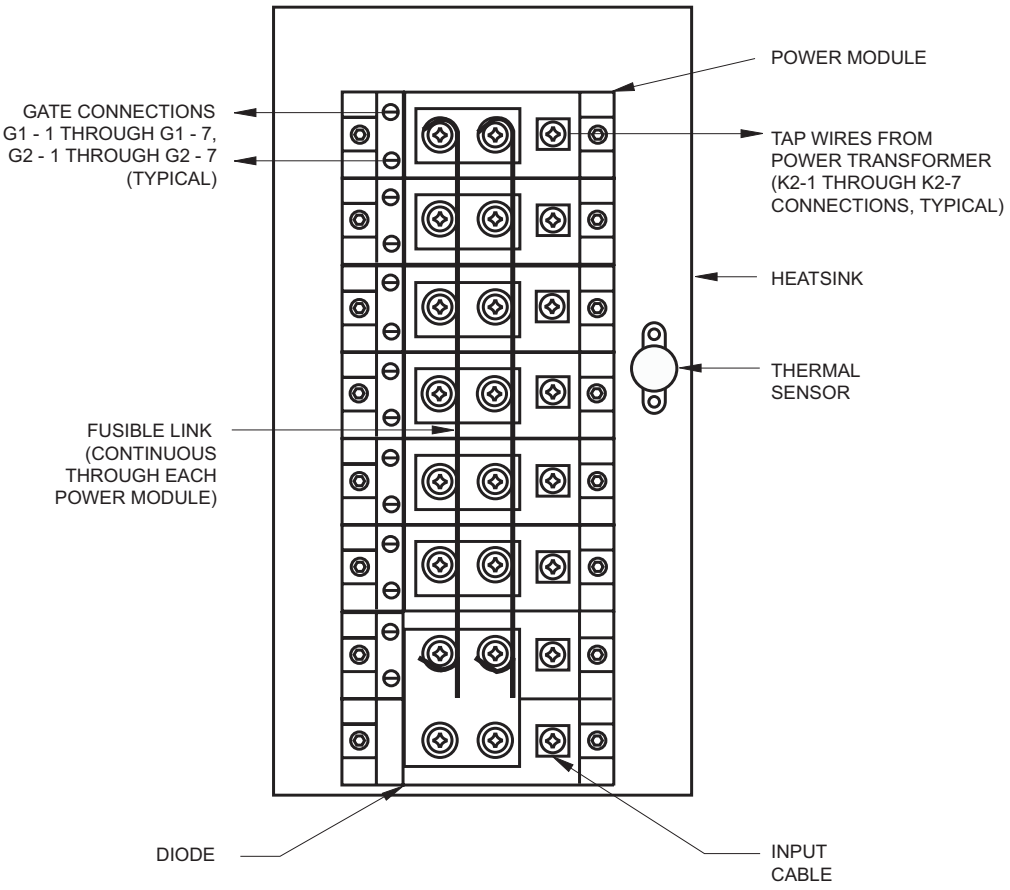
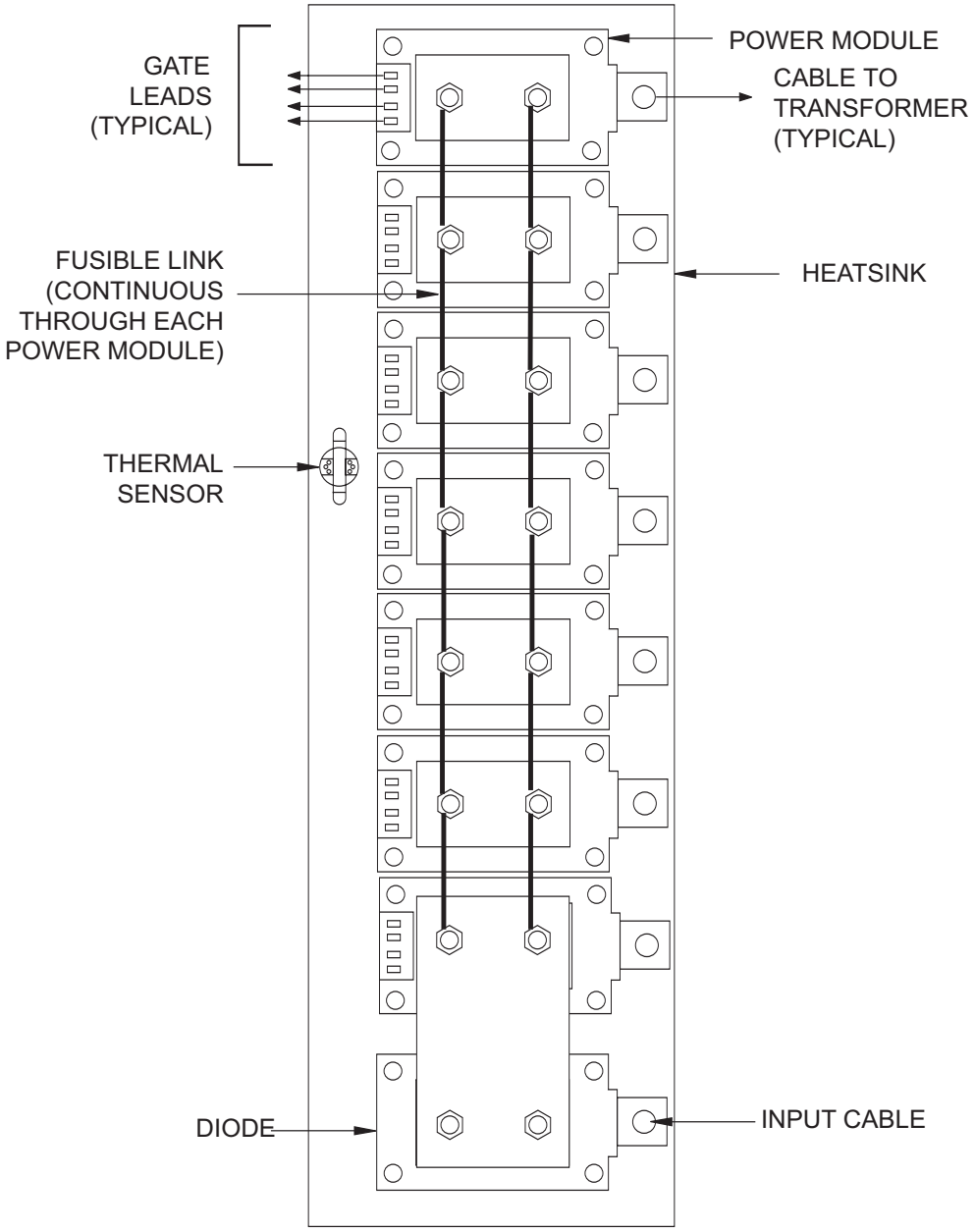

POWER MODULE
GATE CONNECTIONS G1 - 1 THROUGH G1 - 7, G2 - 1 THROUGH G2 - 7 (TYPICAL)
TAP WIRES FROM POWER TRANSFORMER (K2-1 THROUGH K2-7 CONNECTIONS, TYPICAL)
HEATSINK
THERMAL SENSOR
FUSIBLE LINK (CONTINUOUS THROUGH EACH POWER MODULE)
DIODE
INPUT CABLE

Figure 3-10: Power-Sure™ 700 — 225-300kVA SCR Heatsink Assembly.



3.9 Field Adjustments of Circuit Cards

3.9.1 Power-Sure™ 700 Control Card #49120/407415

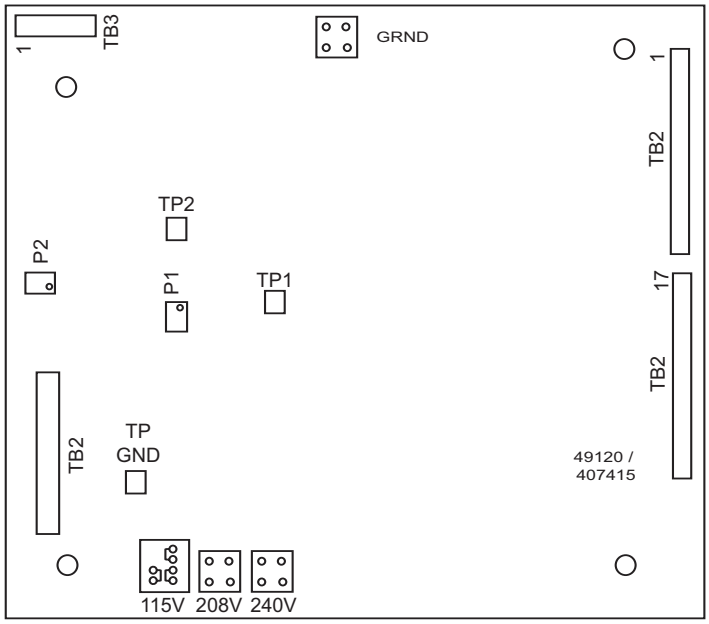
WARNING: **ALL SERVICE TO THIS PIECE OF EQUIPMENT MUST BY PERFORMED BY QUALIFIED PERSONNEL.**

CAUTION: **THE CONTROL BOARD (#49120/407415) IS ELECTRICALLY REFERENCED TO HIGH VOLTAGE, NOT EARTH OR CHASSIS GROUND. EXTREME CARE MUST BE USED WHEN TAKING MEASUREMENTS ON THE CONTROL BOARD. ANY AC POWERED INSTRUMENTS MUST BE GROUND ISOLATED PRIOR TO TAKING MEASUREMENTS. A GROUND ISOLATED INSTRUMENT CASE WILL BE AT THE HIGH VOLTAGE LINE POTENTIAL.**

3.9.2 Control Card Adjustment Procedure

1. Prior to attempting any adjustment, measure the incoming voltage to the unit. Assure the voltage level is within the specified input range of the unit.
2. Turn off power to unit.
3. Remove all loads from the output of unit under adjustment.
4. Remove both TB2 connectors on all control boards #49120/407415. Turn power on.
5. With DC voltmeter on the millivolt scale check between TP1 and TP GND and adjust P2 so meter reads “0” millivolts or as close as possible.

Figure 3-11: Power-Sure™ 700 Controller Card (Top View).



6. Use Formula X below to calculate the next adjustments. You must calculate each input phase for each control card or a total of 3 calculations:
   - For phase 1 control card, measure AC input at Line 1 to Line 2.
   - For phase 2 control card, measure AC input at Line 2 to Line 3.
   - For phase 3 control card, measure AC input at Line 1 to Line 3.

FORMULA X

AC Input x 2.47 = Volts DC at TP2
480 (Nominal)

Example: 475 Volts AC Input x 2.47 = 2.44 Volts DC at TP2
480 (Nominal)

NOTE: **Be sure AC input is stable when making this adjustment. If the input changes, you must re-calculate.**

7. After calculations are complete, place DC voltmeter on 20 volt scale and check between TP2 and TP GND on control card. Adjust pot P1 so meter reads DC level calculated in Step 6 for all 3 phases.

NOTE: **Output voltage correction is a "stepped correction", adjusting P1 will not cause a smooth change in output voltage as it is adjusted.**

8. Turn unit off and reconnect TB2 connectors on all control boards.
9. Turn unit on and verify output is correct by monitoring the output from each line to neutral.

   If output is not correct, make sure input power is stable and repeat adjustment procedure.

NOTE: **P1 Pot turned clockwise = decrease in output voltage and counter-clockwise = increase in output voltage. By changing this adjustment on 1 phase you may see the output voltage change from line to neutral on 2 phases. It is best to use procedures in Steps 1-9 when adjusting.**

3.9.3 Over/Under Voltage Detection Board #35867

NOTE: **Adjustments are referenced from the units output.**

3.9.3.1 Undervoltage Adjustment

1. The under voltage adjustment can be adjusted from -1% (118.5 VAC) to -20% (95 VAC) The standard setpoint is -10% (108 VAC).
2. P2 will adjust the undervoltage set point. One turn on P2 will change the voltage level approximately 1 volt.

   Clockwise = Increase in sensitivity.

   Counter-clockwise = Decrease in sensitivity.

3.9.3.2 Overvoltage Adjustment

1. The over voltage adjustment can be adjusted from +1% (121 VAC) to +20% (145 VAC).

   The standard set point is +10% (132 VAC).

2. P1 will adjust the overvoltage set point. One turn on P1 will change the voltage level approximately 1 volt.

   Clockwise = Decrease Sensitivity.

   Counter-clockwise = Increase Sensitivity.

3.9.3.3 Delay Adjustment

1. The delay adjustment can be adjusted for a minimum of 5 cycles to a maximum of 15 seconds.

   The standard set point is 6 seconds.

2. P3 adjusts the delay.

   - All the way counter-clockwise = 5 cycles.
   - All the way clockwise = 15 seconds.

After two turns clockwise from the full counter-clockwise position, each turn equals approximately 1/2 second.

3.10 Manual Bypass Switch Option

The manual bypass switch is a break before make switch located on the Power-Sure™ 700. The manual bypass switch is used to bypass all power electronics in case of failure.

NOTE: This switch may be added in the field.

3.10.1 Normal Mode

With the switch in the normal position, the Power-Sure™ 700 will provide clean and regulated power to the critical loads. The Power-Sure™ 700 should have the switch in the normal position unless a failure has occurred.

3.10.2 Bypass Mode

With the switch in the bypass position, the Power-Sure™ 700 will provide clean power to the critical loads. In the bypass position, the unit will not regulate the incoming voltage. The Power-Sure™ 700 should be placed in the bypass position when a failure of the system has occurred. This provides the user with some protection until a service technician arrives.

CAUTION: PRIOR TO SWITCHING FROM ONE POSITION TO ANOTHER, TURN OFF THE AC INPUT BREAKER. SOME SYSTEMS ARE EQUIPPED WITH PUSH-TO-TURN SWITCHES. WITH THESE SWITCHES THE SWITCH WILL SHUNT TRIP THE INPUT BREAKER WHEN PRESSED IN.

3.10.3 Remote Emergency Power OFF (REPO) (Optional)

The REPO is operated by a remote push button that when depressed will shunt trip the Power-Sure™ 700 input breaker and disable the unit. This option may be added to units in the field. Contact the Customer Care Center if you wish to add these options.

3.11 Replacement Parts

Individual components are available upon request. Please contact MGE for specific part numbers and prices. See Section 3.7 in this manual for component location and description. When contacting MGE Service at 1-800-523-0142, please have the unit's full model number and serial number for identification.

3.12 Part Numbers

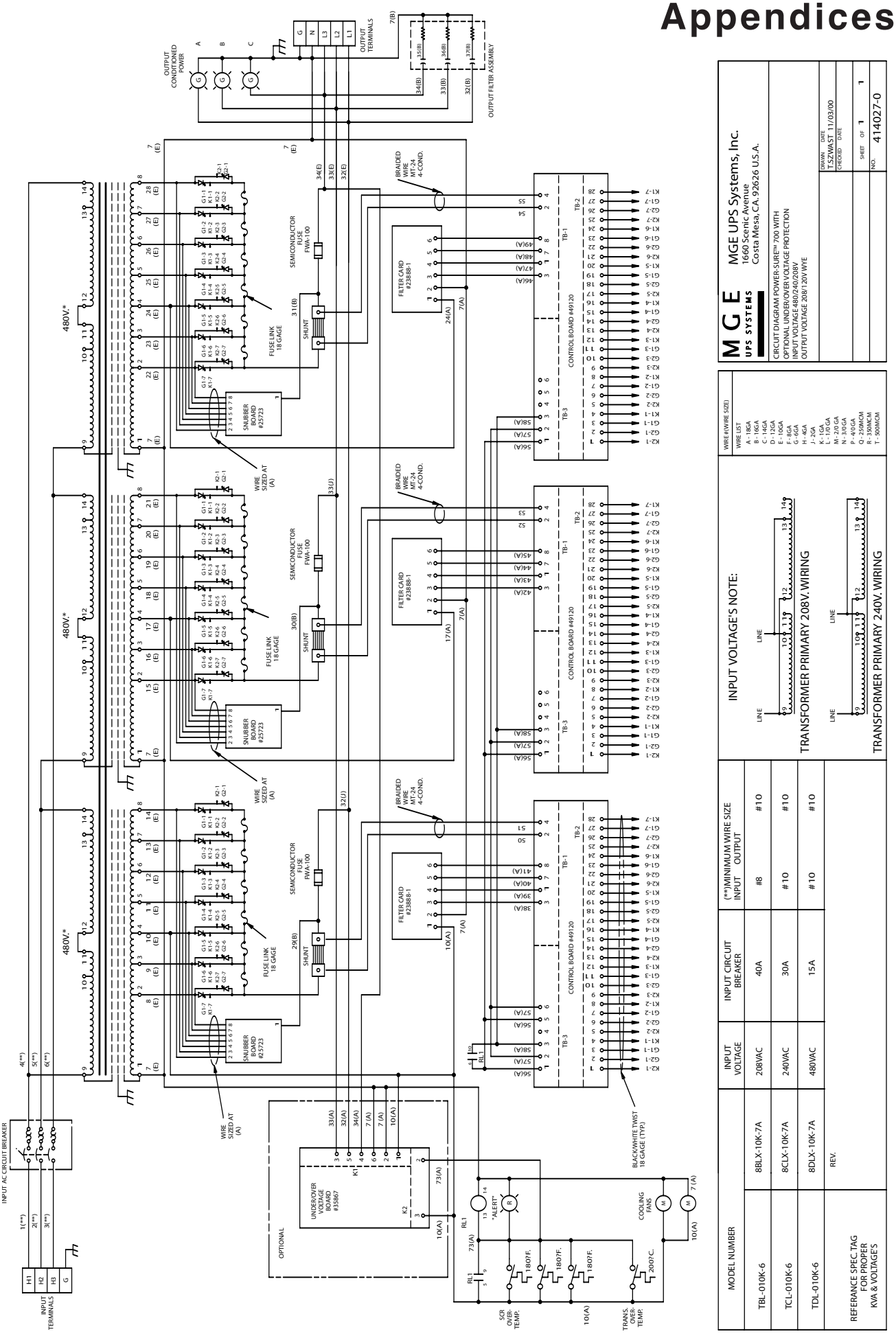
Table 3-1: Power-Sure™ 700 Power Conditioners Part Numbers.

Part Number	kVA	Input Voltage	Output Voltage	Hz
TBN-010K-6	10	208	480/277	60
TBN-015K-6	15			
TBN-025K-6	25			
TBN-030K-6	30			
TBN-045K-6	45			
TBN-050K-6	50			
TBN-075K-6	75			
TBL-010K-6	10	208	208/120	60
TBL-015K-6	15			
TBL-025K-6	25			
TBL-030K-6	30			
TBL-045K-6	45			
TBL-050K-6	50			
TBL-075K-6	75			
TBL-100K-6	100			
TBL-125K-6	125			
TBL-150K-6	150			
TBL-225K-6	225			
TBL-300K-6	300			
TCN-010K-6	10	240	480/277	60
TCN-015K-6	15			
TCN-025K-6	25			
TCN-030K-6	30			
TCN-045K-6	45			
TCN-050K-6	50			
TCL-010K-6	10	240	208/120	60
TCL-015K-6	15			
TCL-025K-6	25			
TCL-030K-6	30			
TCL-045K-6	45			
TCL-050K-6	50			
TCL-075K-6	75			
TCL-100K-6	100			

Table 3-1: Power-Sure™ 700 Power Conditioners Part Numbers (Continued).

Part Number	kVA	Input Voltage	Output Voltage	Hz
TDL-010K-6	10	480	208/120	60
TDL-015K-6	15			
TDL-025K-6	25			
TDL-030K-6	30			
TDL-045K-6	45			
TDL-050K-6	50			
TDL-075K-6	75			
TDL-100K-6	100			
TDL-125K-6	125			
TDL-150K-6	150			
TDL-225K-6	225			
TDL-300K-6	300			
TDN-010K-6	10	480	480/277	60
TDN-015K-6	15			
TDN-025K-6	25			
TDN-030K-6	30			
TDN-045K-6	45			
TDN-050K-6	50			
TDN-075K-6	75			
TDN-100K-6	100			
TDN-125K-6	125			
TDN-150K-6	150			
TDN-225K-6	225			
TDN-300K-6	300			
TEL-010K-6	10	600	208/120	60
TEL-015K-6	15			
TEL-025K-6	25			
TEL-030K-6	30			
TEL-045K-6	45			
TEL-050K-6	50			
TEL-075K-6	75			
TEL-100K-6	100			
TEL-125K-6	125			
TEL-150K-6	150			
TEL-225K-6	225			
TEL-300K-6	300			
TEN-010K-6	10	600	480/277	60
TEN-015K-6	15			
TEN-025K-6	25			
TEN-030K-6	30			
TEN-045K-6	45			
TEN-050K-6	50			
TEN-075K-6	75			
TEN-100K-6	100			
TEN-125K-6	125			
TEN-150K-6	150			
TEN-225K-6	225			
TEN-300K-6	300			

Figure A-1: 10-50kVA Wiring Diagram.



INPUT VOLTAGE'S NOTE:

WIRE LIST (WIRE SIZE)

A - 18GA
B - 16GA
C - 14GA
D - 12GA
E - 10GA
F - 8GA
G - 6GA
H - 4GA
J - 3GA
K - 1GA
L - 1/0 GA
M - 2/0 GA
N - 3/0 GA
P - 4/0 GA
Q - 250KCM
R - 350KCM
T - 500MCM

MODEL NUMBER		INPUT VOLTAGE	INPUT CIRCUIT BREAKER	(**)MINIMUM WIRE SIZE INPUT	OUTPUT
TBL-010K-6	8BLX-10K-7A	208VAC	40A	#8	#10
TCL-010K-6	8CLX-10K-7A	240VAC	30A	#10	#10
TDL-010K-6	8DLX-10K-7A	480VAC	15A	#10	#10
REFERANCE SPEC TAG FOR PROPER KVA & VOLTAGE'S	REV.				

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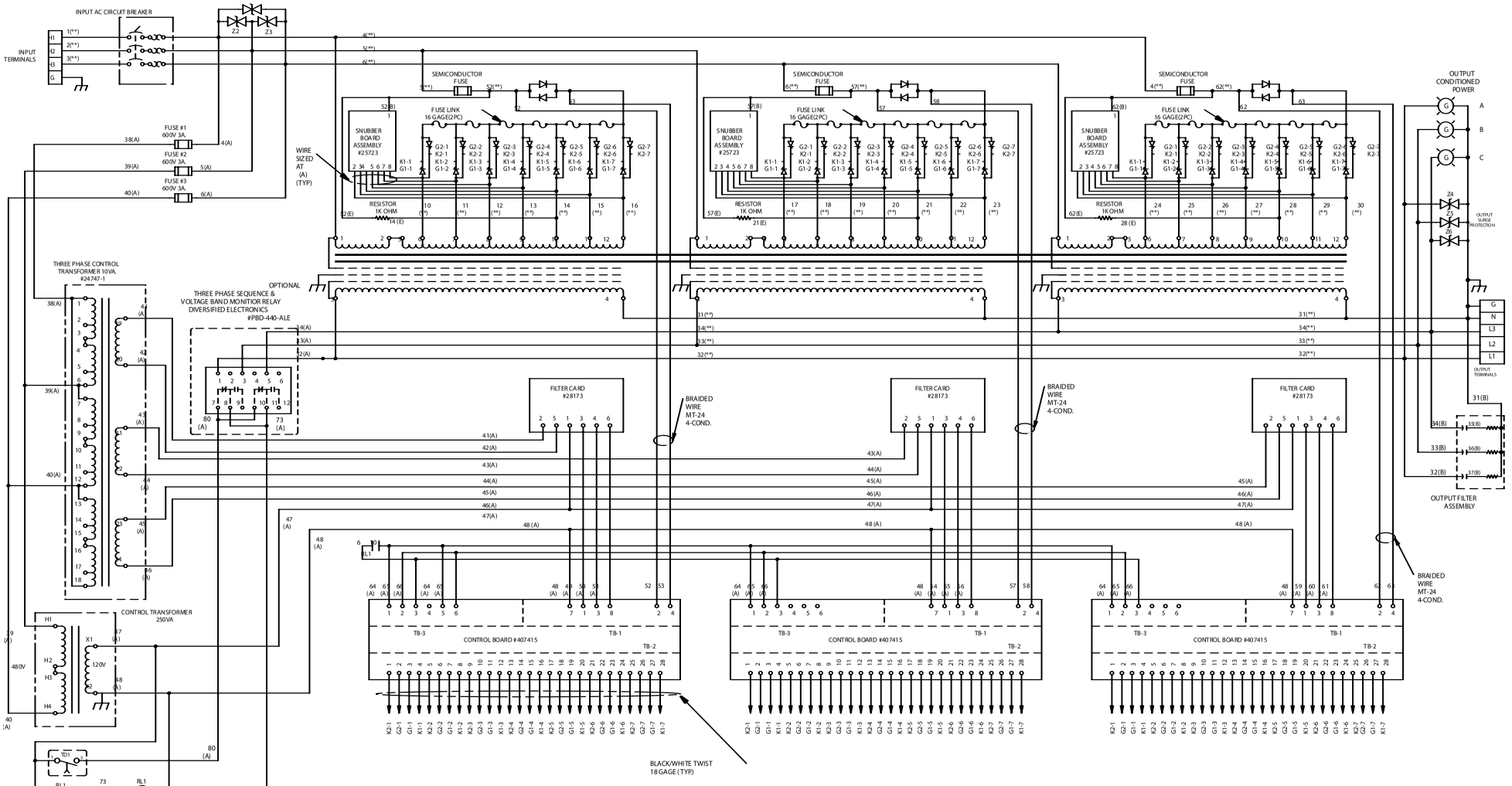
OPTIONAL UNDER/OVER VOLTAGE PROTECTION
INPUT VOLTAGE 480/240/208V
OUTPUT VOLTAGE 208/120V WYE

	DRAWN	DATE
	T.SZWAST	11/03/00
	CHECKED	DATE
SHEET	OF	1
NO.	414027-0	

Figure A-2: 75-150kVA Wiring Diagram.



MODEL NUMBER		INPUT VOLTAGE	INPUT CIRCUIT BREAKER	(**)MINIMUM WIRE SIZE INPUT	OUTPUT	SEMI-CONDUCTOR FUSES
TDN-075K-6	8DNX-75K-7A	480VAC	125A	#4	#4	FWH-200
TDN-125K-6	8DNX-125K-7A	480VAC	200A	#1/0	#1/0	FWH-600
TDN-150K-6	8DNX-150K-7A	480VAC	225A	#1/0	#1/0	FWH-600
75,125,150KVA	REV.					

REFERANCE SPEC.TAG FOR PROPER KVA & VOLTAGE'S

WIRE #(WIRE SIZE)

WIRE LIST

A - 18GA
B - 16GA
C - 14GA
D - 12GA
E - 10GA
F - 8GA
G - 6GA
H - 4GA
J - 2GA
K - 1GA
L - 1/0 GA
M - 2/0 GA
N - 3/0 GA
P - 4/0 GA
Q - 250MCM
R - 350MCM
T - 500MCM

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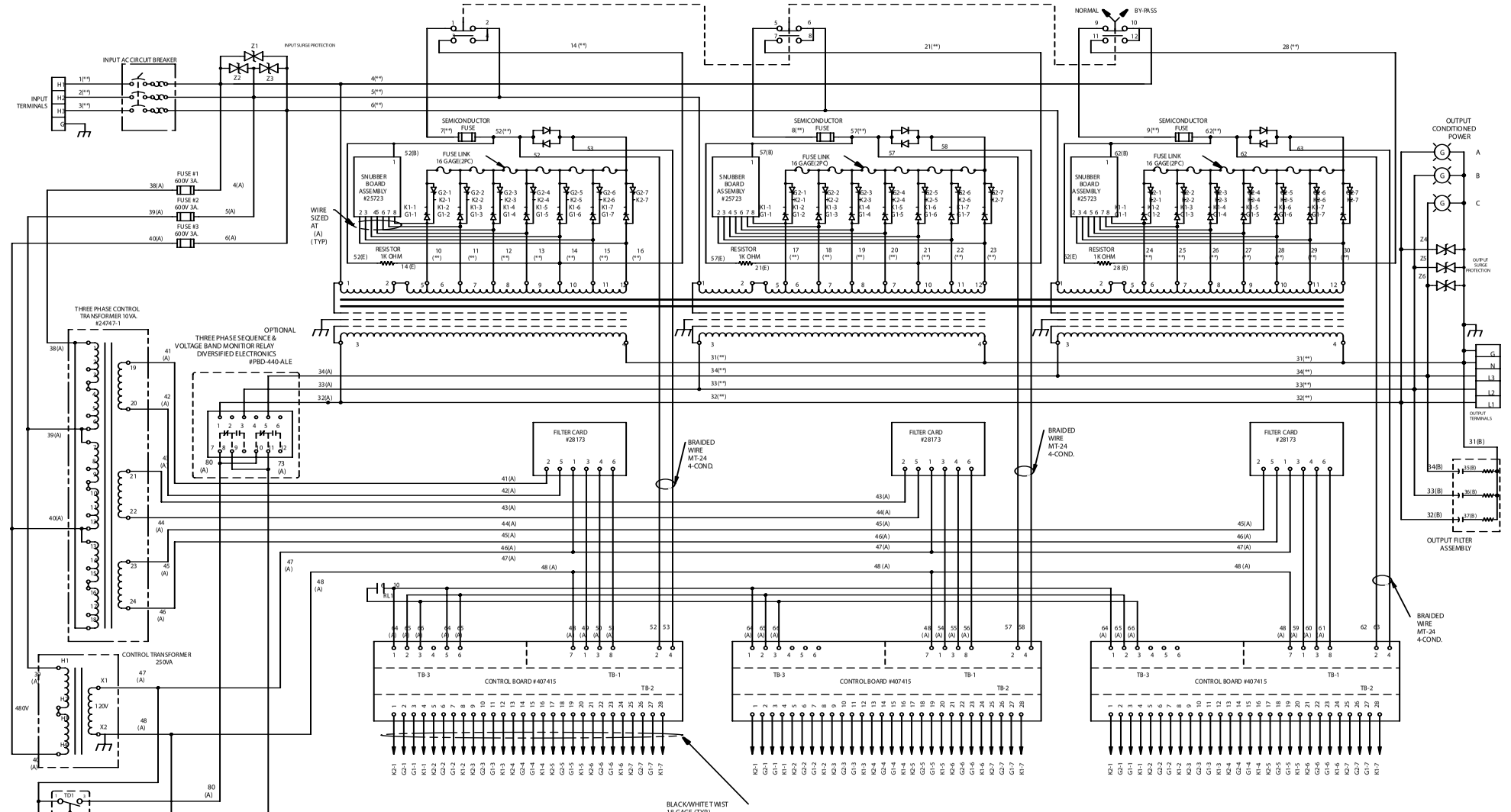
OPTIONAL UNDER/OVER VOLTAGE PROTECTION
INPUT VOLTAGE 480V
OUTPUT VOLTAGE 480/277V WYE

DRAWN DATE T.SZWAST 12/15/00
CHECKED DATE
SHEET OF 1 1
NO. 414194-0

86-108814-00 B01

Figure A-3: 225-300kVA Wiring Diagram.



MODEL NUMBER		INPUT VOLTAGE	INPUT CIRCUIT BREAKER	(**)MINIMUM WIRE SIZE INPUT	OUTPUT	SEMI-CONDUCTOR FUSES
TDN-075K-6	8DNX-75K-7A	480VAC	125A	#4	#4	FWH-200
TDN-125K-6	8DNX-125K-7A	480VAC	200A	#1/O	#1/O	FWH-600
TDN-150K-6	8DNX-150K-7A	480VAC	225A	#1/O	#1/O	FWH-600
75,125,150KVA REFERANCE SPEC.TAG FOR PROPER KVA & VOLTAGE'S		REV.				

WIRE #(WIRE SIZE)

WIRE LIST

A - 18GA
B - 16GA
C - 14GA
D - 12GA
E - 10GA
F - 8GA
G - 6GA
H - 4GA
J - 2GA
K - 1GA
L - 1/0 GA
M - 2/0 GA
N - 3/0 GA
P - 4/0 GA
Q - 250 MCM
R - 350 MCM
T - 500 MCM

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INPUT VOLTAGE 480V
OUTPUT VOLTAGE 480/277V WYE

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MGE Warranty & Proprietary Rights Statement for Three Phase Products

(Applicable within the United States, Canada and Mexico)

MGE Standard Three Phase Warranty

MGE UPS SYSTEMS, INC. ("MGE") warrants three phase products it manufactures to be free from defects in materials and workmanship for a period of three hundred sixty five (365) days counting from the date of purchase by or for the first end user ("Purchaser"), or, if applicable, the date of MGE's completion of initial startup of the subject product, provided however said warranty shall not exceed eighteen (18) months from the date of delivery of the subject product to Purchaser (the "Warranty Period"). MGE's liability hereunder is limited to replacing or repairing at MGE's factory or on the job site, at MGE's option, any part or parts that are defective and reported to MGE during the Warranty Period. MGE shall have the sole right to determine if the parts are to be repaired at the job site or whether they are to be returned to the factory for repair or replacement. All items returned to MGE for repair or replacement must be sent freight prepaid to its factory. Purchaser must obtain MGE's Return Goods Authorization ("RGA") prior to returning items. The conditions stated herein must be met for MGE's warranty to be valid. MGE will not be liable for any damage caused by or resulting from unauthorized repair work, unauthorized replacement parts, from any unintended application of the Three Phase Product, for damage due to accident, abuse, or act of God (such as earthquake, flood, inclement weather, rain or fire), or relating to Purchaser's failure to provide proper environmental conditions for the product.

In no event shall MGE be liable for loss, damage, or expense directly or indirectly arising from the use of or any defects in the subject product, or from any other cause, except as expressly stated in this warranty. EXCEPT AS EXPRESSLY STATED IN THIS WARRANTY, MGE MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE OR NON-INFRINGEMENT. MGE is not liable for and Purchaser waives any right of action it has or may have against MGE for any consequential or special damages arising out of any breach of warranty, and for any damages Purchaser may claim for damage to any property or injury or death to any person arising out of its purchase or the use, operation or maintenance of the subject product. The warranty stated herein includes parts and labor; however, MGE will not be liable for any labor subcontracted or performed by Purchaser for preparation of the warranted item for return to MGE's factory or for preparation work for field repair or replacement, and MGE will not be responsible to pay any invoice therefore.

This warranty shall be exclusive of any and all other warranties express or implied and may be modified only by a writing signed by an authorized officer of MGE. This warranty shall extend to the Purchaser but to no one else. Accessories supplied by MGE, but manufactured by others, carry any warranty the manufacturers have made to MGE, and which can be passed on to the Purchaser.

MGE makes no warranty with respect to whether the products sold hereunder infringe any patent, U.S. or foreign, and Purchaser represents that any specially ordered products do not infringe any patent. Purchaser agrees to indemnify and hold MGE harmless from any liability by virtue of any patent claims where Purchaser has ordered a product design based on the Purchaser's specifications, or conforming to Purchaser's specific design.

Purchaser has not relied and shall not rely on any oral representation regarding any products sold hereunder and any oral representation shall not bind MGE and shall not be part of this or any other any warranty. There are no warranties which extend beyond the description on the face hereof. In no event shall MGE UPS SYSTEMS, INC. be responsible for consequential damages or for any other damages except as expressly stated herein.

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For Three Phase Warranty outside of the United States, Canada and Mexico, refer to Three Phase International Warranty.

February 2006 Rev C01

MGE Customer Care Center — Three Phase Products

Technical Support and Product Services

Technical questions? If you encounter a problem while following the instructions in this manual, or have question the operation, repair, or servicing of your equipment, please direct calls to MGE UPS SYSTEMS, INC. Customer Care Center or visit our web site www.mgeups.com for complete service information.

To insure that your questions are correctly answered, please obtain the serial number of the unit and include them in any discussions or correspondence.

Serial number: _____

Who To Contact

Customer Care Center: **1-800-438-7373 (Hours: 24/7)**

Customer FAQ
or International calls: **1-714-557-1636**

Commitment: MGE UPS SYSTEMS, INC. is committed to providing easy to access factory trained experts that will provide responses to any questions that you might have.

Scheduling Field Service Engineer Support

Scheduling of the MGE Field Service Engineers typically should be done 7 to 10 days before they are required on-site. If the startup of the product is critical to maintaining your schedule, please call the MGE toll free telephone number at **1-800-438-7373** for assistance.

Return Policy for Repair of Three Phase Products (RGA)

Should you require factory service for your equipment, contact MGE Customer Care Center and obtain a Return Goods Authorization (RGA) prior to shipping your unit. Never ship equipment to MGE without first obtaining an RGA number.

Date: _____

RGA Number: _____

Contact Name: _____

Contact MGE

United States

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Costa Mesa, CA 92626

Tel: (714) 557-1636
CCC: (800) 438-7373
Fax: (714) 557-9788
email: info@mgeups.com
www: mgeups.com

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MGE UPS SYSTEMS
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Mississauga, ON L4T 4E8

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(877) 672-0990
Fax: (905) 672-7667
email: info@mgeups.com
www: mgeups.com

Latin America and Other International

MGE UPS SYSTEMS
1660 Scenic Ave.
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